

PUBLIC SERVICE COMMISSION OF WISCONSIN

Memorandum

May 20, 2016

FOR COMMISSION AGENDA

TO: The Commission

FROM: Jeff Ripp, Administrator
Division of Energy Regulation

RE: Application of Highland Wind Farm, LLC, for a Certificate of Public Convenience and Necessity to Construct a 102.5 Megawatt Wind Electric Generation Facility and Associated Electric Facilities, to be Located in the Towns of Forest and Cylon, St. Croix County, Wisconsin 2535-CE-100

On remand from Decision and Order, *Town of Forest v. Pub. Serv. Comm'n*, Case No. 14-CV-18 (Wis. Cir. Ct. St. Croix Cnty. Aug. 27, 2015)

Suggested Minute: The Commission, on remand, (accepted/did not accept) into the record additional studies, reports, articles, or other reference materials offered by the parties and members of the public.

The Commission, on remand, (accepted/did not accept) into the record (all/some/none) of the comments of the parties and members of the public.

The Commission, on remand, (amended/did not amend and directed a hearing or further opportunity to be heard before amending) its Final Decision on Reopening served October 25, 2013, on the application of Highland Wind Farm, LLC, for a Certificate of Public Convenience and Necessity to construct a 102.5 megawatt wind electric generation facility to address the issue of the 95 percent compliance standard.

The Commission, on remand, (amended/did not amend and directed a hearing or further opportunity to be heard before amending) its Final Decision on Reopening served October 25, 2013, on the application of Highland Wind Farm, LLC, for a Certificate of Public Convenience and Necessity to construct a 102.5 megawatt wind electric generation facility to address the issue of a lower noise limit for specific residences.

On March 15, 2016, the Commission issued an Order to Reopen, Notice and Request for Comments, pursuant to Wis. Stat. §§ 196.39 and 227.45, of the Commission's Final Decision on Reopening granting Highland Wind Farm, LLC (Highland), a Certificate of Public Convenience and Necessity (CPCN) to construct a 102.5 megawatt wind electric generation facility and associated electric facilities, to be located in the town of Forest, St. Croix County, Wisconsin. ([PSC REF#: 283217](#).) The Commission's Order, dated March 15, 2016, reopened the docket for the limited purpose of addressing the issues remanded by the Decision and Order in *Town of Forest v. Pub. Serv. Comm'n of Wis.*, No. 14-CV-18 (Wis. Cir. Ct. St. Croix Cnty. Aug. 27, 2015) ([DL: 1263073](#)).

The two substantive issues remanded to the Commission for further action involved: (1) the adoption of a percentage compliance standard; and (2) the Commission's acceptance of Highland's agreement to comply with a 40 decibel adjusted (dBA) nighttime noise standard at six residences identified as occupied by potentially "sensitive" individuals.

On the issue of the 95 percent compliance standard, the circuit court made the following determinations: (1) the Commission failed to provide adequate notice and a proper hearing on the adoption of a new compliance standard; (2) the creation of a new compliance standard amounted to an unauthorized rulemaking that exceeded its authority; (3) the new compliance standard was not void for being vague, ambiguous, or impossible to enforce; and (4) the adoption of a new compliance standard was without substantial evidence in the record to support it. (Decision and Order at 115-116.) The circuit court set aside the Commission's adoption of a

95 percent compliance standard and remanded the issue to the Commission for a further hearing “on the issue of adopting a percentage compliance standard.”¹ (*Id.*)

On the issue of the Commission’s acceptance of Highland’s agreement to comply with a 40 dBA nighttime noise standard at certain specific residences, the circuit court made the following determinations: (1) the Commission failed to provide a full hearing on the selection of the “sensitive” residences for additional protective standards; and (2) the Commission’s adoption of Commission staff’s selection of six residences and Highland’s agreement to a lower noise standard for those selected residences was without substantial evidence. As a result, the circuit court ordered:

The matter is remanded to the Commission, not for further evidentiary hearing on other residents who may be sensitive to noise and/or shadow flicker, but for the purpose of allowing the Commission to state why, if it can, based on the record already accumulated, the six residences were selected and the other eleven were not. If, based upon the record herein, the Commission is not able to state why the six residences were selected and the other eleven were not, then the matter is reopened solely for the purpose of allowing the parties to state why other sensitive residences, already identified, should be considered and the Commission can then decide if others, already identified, should be included with the original six residences.

(*Id.* at 116.) The circuit court, however, also noted in its Decision and Order, that “[t]his Court is fully aware that no accommodation needed to be ordered by the Commission for any of the 17 identified residences.” (*Id.* at 111.)

¹ The circuit court also set aside the Commission’s action modifying its noise protocols to include a 95 percent compliance standard. However, pending the outcome of the litigation, the Commission did not modify its noise protocols. Considering the finding by the court, the Commission stated that it does not intend to modify its noise protocols to adopt a compliance standard so this issue is moot.

Consistent with the Decision and Order of the circuit court and pursuant to its authority under Wis. Stat. § 196.39,² the Commission provided notice to the parties and other interested persons of the limited reopening, and provided an opportunity to be heard on the following:

1. The Commission's intention to modify its Final Decision on Reopening to remove the pre-established 95 percent compliance standard and address any complaints concerning alleged non-compliance with the noise standards, based on the specific factual situation, at the time any non-compliance is alleged.

2. To allow the parties to state why the six identified potentially sensitive residences, and other potentially sensitive residences already identified in Ex.-Forest-Junker-20, should be considered for lower noise requirements than is provided for in Wis. Admin. Code § PSC 128.14(3), so that the Commission could decide whether to include lower noise requirements for either these six or any additional residences.

3. To take official notice under Wis. Stat. § 227.45 of the following governmental reports of peer-reviewed studies, relating to whether any identified health concerns are affected by wind electric generation facilities, and provide the parties an opportunity, as required by Wis. Stat. § 227.45, to rebut or present countervailing evidence:

a. The Wisconsin Wind Siting Council Wind Turbine Siting-Health Review and Wind Siting Policy Update ([PSC REF#: 285629](#)); and

² Wisconsin Stat. § 196.39 Change, amendment and rescission of orders; reopening cases.

(1) The commission at any time, upon notice to the public utility and after opportunity to be heard, may rescind, alter or amend any order fixing rates, tolls, charges or schedules, or any other order made by the commission, and may reopen any case following the issuance of an order in the case, for any reason.

(2) An interested party may request the reopening of a case under s. 227.49.

(3) Any order rescinding, altering, amending or reopening a prior order shall have the same effect as an original order.

(4) Within 30 days after service of an order, the commission may correct an error or omission in the order related to transcription, typing or calculation without hearing if the correction does not alter the intended effect of the order.

(5) This section does not apply to an order issued under s. 196.371.

b. Review of Studies and Literature Relating to Wind Turbines and Human Health ([PSC REF#: 285630](#)).

The docket was not opened to address issues where the Commission's decision was either not challenged in the judicial review proceedings or was affirmed by the circuit court in those proceedings, including the Commission's determination, pursuant to Wis. Stat. § 196.491(3)(d)6., that the project would not unreasonably interfere with the orderly land use and development plans in the project area, and the Commission's determination that the curtailment plan proposed by Highland in the reopened proceeding demonstrated compliance with the noise standards.

The Commission provided a 30-day comment period for the parties and public and accepted comments through its public web site and via U.S. mail. The Commission received comments from the following parties: Highland ([PSC REF#: 284905](#)), the Town of Forest (Town) ([PSC REF#: 285292](#) Confidential, [PSC REF#: 285293](#) Redacted),³ Forest Voice ([PSC REF#: 284904](#)), Clean Wisconsin (Clean WI) ([PSC REF#: 285642](#)),⁴ and RENEW Wisconsin (RENEW) ([PSC REF#: 284891](#)). A comment was also received from Richard James ([PSC REF#: 284895](#)), who appeared as an expert for Forest Voice in the underlying proceeding. In excess of 130 comments were also received from members of the public from within and outside the project area, from areas near other wind developments in Wisconsin and elsewhere, and from other states and countries.⁵

The purpose of this memorandum is to summarize the issues presently before the Commission, provide an overview of the additional studies, reports, articles, and other references

³ The Town's comments were timely received and were re-filed to correct filing errors and to protect personal identifying information.

⁴ Clean Wisconsin's comments were timely received and were re-filed to include, as exhibits, information cited in the comments as required by the filing guidelines. *See*, Ex.-CW-Cook-1 through Ex.-CW-Cook-10 ([PSC REF#: 285631](#), [PSC REF#: 285632](#), [PSC REF#: 285633](#), [PSC REF#: 285634](#), [PSC REF#: 285635](#), [PSC REF#: 285636](#), [PSC REF#: 285637](#), [PSC REF#: 285638](#), [PSC REF#: 285639](#), [PSC REF#: 285640](#)).

⁵ *See* Appendix B to this memorandum for the identification and categorization of the public comments received.

offered by the parties and the public, generally review the comments received during the comment period, and to provide the Commission with potential alternatives to consider on each issue remanded by the circuit court.

Evidentiary Issues

Prior to addressing the two specific substantive issues remanded by the circuit court, there are evidentiary issues that must be addressed by the Commission. Wisconsin Stat. § 227.45(2) requires that “[a]ll evidence, including records and documents in the possession of the agency or hearing examiner of which the agency or hearing examiner desires to avail himself or herself, shall be duly offered and made a part of the record in the case. . . .” Accordingly, the Commission must first determine what evidence it is accepting in this limited reopening on remand. The evidence generally falls into two categories: (1) studies, reports, articles, and other reference materials; and (2) written comments of parties and members of the public.

A. Studies, Reports, Articles, and Other Reference Materials Offered

Pursuant to Wis. Stat. § 196.39(1), the Commission reopened the record in this proceeding to take official notice under Wis. Stat. § 227.45 of two governmental reports of peer-reviewed studies: Wisconsin Wind Siting Council Wind Turbine Siting-Health Review and Wind Siting Policy Update (2014 Review) ([PSC REF#: 285629](#)) and Review of Studies and Literature Relating to Wind Turbines and Human Health (2015 Review) ([PSC REF#: 285630](#)). The Commission’s Final Decision on Reopening was issued on October 25, 2013, prior to the issuance of either of these reports on the peer-reviewed literature related to wind turbine siting and human health.

The 2014 Review, issued on October 31, 2014, was required under Wis. Stat. § 196.378(4g)(e), which directed the Wind Siting Council to “survey the peer-reviewed scientific

research regarding the health impacts of wind energy systems and study state and national regulatory developments regarding the siting of wind energy systems.” The 2014 Review notes that “[a]s part of the Council’s work while developing its 2010 wind siting recommendations that led to the creation of the Commission’s administrative rules relating to wind energy systems, Wis. Admin. Code ch. PSC 128 (PSC 128), the Council provided an exhaustive and then up-to-date review of pertinent wind-health scientific literature. This report covers new information that has been published in the scientific literature from 2011 to 2014. To prepare this report, Council members collected literature related to the effects of wind energy systems on human health. Commission staff also conducted a formal literature review. These efforts identified over 40 peer-reviewed publications on wind-health issues and three governmental reports.” (2014 Review at 2.)

The 2014 Review concludes: “[b]ased on the available literature, what the Council can reasonably conclude is that some individuals residing in close proximity to wind turbines perceive audible noise and find it annoying. A small subset of these individuals report that this noise negatively affects their sleep and may result in other negative health effects. However, based on objective surveys near wind energy projects, it appears that this group is in the minority and that most individuals do not experience annoyance, stress, or perceived adverse health effects due to the operation of wind turbines. This conclusion is especially true if wind turbine siting is used to limit high noise exposure.” (2014 Review at 3-4.)

A similar requirement to Wis. Stat. § 196.395(4g)(e) was included in 2015 Wisconsin Act 55, which required the Commission to “conduct a review of studies conducted to ascertain the health effects of industrial wind turbines on persons residing near the turbine installations.” The 2015 Review was issued in December 2015 and concludes that “the research literature on

this subject continues to show trends similar to those identified in the 2014 WSC report.” (2015 Review at 1.) The 2015 Review concludes that “[t]he studies have found an association between exposure to wind turbine noise and annoyance for some residents near wind energy systems. Some studies show this as a causal relationship between wind turbines and annoyance. There is more limited and conflicting evidence demonstrating an association or a causal relationship between wind turbines and sleep disturbance. There is a lack of evidence to support other hypotheses regarding human health effects caused by wind energy systems. Overall, the research in this area is limited and insufficient to determine causal relationships between variables.” (2015 Review at 9.)

Forest Voice and Highland did not offer studies as part of their comments. Clean Wisconsin provided ten studies from peer-reviewed journals and the Town provided two studies published in peer-reviewed journals, and one from a magazine on acoustics. RENEW provided an article ([PSC REF#: 284891](#)) that summarized some points from one study reviewed by the 2015 Review. (McCunney *et al.* 2014.)

Six of the studies⁶ provided by Clean WI are from Health Canada’s Community Noise and Health Study, recently published in the Journal of the Acoustical Society of America, and provide further information to support preliminary results first released in 2014. These papers describe study methodology, modeling results, and conclusions on wind turbine noise and various self-reported or observed responses. They generally support the findings that no

⁶ Michaud *et al.* (1) 2016. Exposure to wind turbine noise: Perceptual responses and reported health effects. ([PSC REF#: 285640](#).) Michaud *et al.* (2) 2016. Self-reported and measured stress related responses associated with exposure to wind turbine noise. ([PSC REF#: 285631](#).) Michaud *et al.* (3) 2016. Personal and situational variables associated with wind turbine noise annoyance. ([PSC REF#: 285633](#).) Voicescu *et al.* 2016. Estimating annoyance to calculated wind turbine shadow flicker is improved when variables associated with wind turbine noise exposure are considered. ([PSC REF#: 285635](#).) Keith *et al.* (1) 2016. Wind turbine sound pressure level calculations at dwellings. ([PSC REF#: 285637](#).) Keith *et al.* (2) 2016 Wind turbine sound power measurements. ([PSC REF#: 285639](#).)

evidence was found to support a link between exposure to wind turbine noise and self-reported illnesses, chronic conditions, stress, or sleep quality, while an association was found between increasing levels of wind turbine noise and the number of individuals reporting to be very or extremely annoyed. The two papers by Keith *et al.* describe how the study found that A-weighted and C-weighted sound results were strongly correlated, of relevance to discussions of whether sound measurements in dBA are able to accurately indicate how much low frequency or infrasound to which residents would be exposed.

The other four papers provided by Clean WI were also published in 2016 and range from a study in Japan⁷ that examined self-reported sleep problems and wind turbine noise, a survey in Denmark⁸ that examined the effect of other environmental exposures on reported symptoms, and two others that are not as directly relevant; one looks at the impact of the nocebo effect and is not specific to wind turbines⁹ while the other is more involved with studying sound measurement methodology.¹⁰

The Town provided three documents that discuss theoretical ways wind turbines could affect human health. One is an older journal article¹¹ that discusses the risk of photosensitive epilepsy seizures from shadow flicker, generally considered to be more of a risk with small turbines, and not of the size approved for this project. Another peer-reviewed journal article¹²

⁷ Kageyama *et al.* 2016. Exposure-response relationship of wind turbine noise with self-reported symptoms of sleep and health problems: A nationwide socioacoustic survey in Japan. ([PSC REF#: 285636.](#))

⁸ Blanes-Vidal and Schwartz 2016. Wind turbines and idiopathic symptoms: The confounding effect of concurrent environmental exposures. ([PSC REF#: 285632.](#))

⁹ Porsius *et al.* 2015. Nocebo responses to high-voltage power lines: Evidence from a prospective field study. ([PSC REF#: 285634.](#))

¹⁰ Katinas *et al.* 2016. Analysis of the wind turbine noise emissions and impact on the environment. ([PSC REF#: 285638.](#))

¹¹ Harding *et al.* 2008. Wind turbines, flicker, and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them. ([PSC REF#: 285293.](#))

¹² Schomer *et al.* 2015. A theory to explain some physiological effects of the infrasonic emissions at some wind farm sites. ([PSC REF#: 285293.](#))

published in the Journal of the Acoustical Society of America presents a theory to examine how reported physiological effects could be influenced by infrasound from wind farms. It uses data gathered at the Shirley Wind Farm. The third document¹³ provided is from Acoustics Today, a magazine published by the Acoustical Society of America. That article also presents theories as to how inaudible sound might affect human health. These last two articles do not show direct evidence of health effects from wind turbine noise, but are showing hypothetical ways of how inaudible sound could still possibly affect human health for those with conditions that affect the inner ear. The Town also advocated that the Commission accept the Wind Siting Minority Report 2014.¹⁴

Several members of the public also provided references to articles, or articles themselves, on the topic of wind turbines and human health.¹⁵ These vary in their source, age, and relevance to the issues that are part of this reopening. Many of the journal articles provided are not directly related to the issue of wind turbines and human health, but reach to further discussions such as: general environmental noise impacts, research that is not directly comparable to human health impacts at non-participating residences, or research on mechanisms where infrasound could possibly impact human health, without showing those impacts at the level of infrasound produced by wind farms.

A list of these articles with brief summaries are collected with those provided by parties in Appendix A at the end of this document. The Commission has been separately provided with

¹³ Salt and Lichtenhan. 2014. How does wind turbine noise affect people? ([PSC REF#: 285293](#).)

¹⁴ The Minority Report is included in the 2014 Review, at Appendix F. ([PSC REF#: 285629](#).) As the Commission has taken official notice of the 2014 Review, this information is already part of the record.

¹⁵ To the extent Commission staff could locate the article from the reference provided, it was included in the summary in Appendix A. If the Commission accepts some or all of the references offered by members of the public, copies of the articles (subject to any copyright restrictions), will be entered into the record. Where a commenter provided a link to a webpage that summarized other documents, or just provided a text narrative, these were not included. Discrete papers or documents, whether peer-reviewed or not, were considered as one threshold for inclusion rather than text found on web pages that are open to editing at any time.

the offered studies and articles for its independent review. Commission staff's summary in this memorandum and in Appendix A are provided merely to guide the Commission and are not intended to supplant the Commission's independent review and assessment of the studies and articles offered.

The Commission took official notice under Wis. Stat. § 227.45 of the 2014 Review and 2015 Review that were unavailable when it issued its Final Decision on Reopening and afforded the parties an opportunity to rebut the reports or provide countervailing evidence through a 30-day comment period.

The Commission must decide whether, in addition to the 2014 Review and 2015 Review, to accept any of the additional studies, articles, or references offered by the parties or members of the public. Wisconsin Stat. § 227.45(1) provides:

Except as provided in s. 901.05, an agency or hearing examiner shall not be bound by common law or statutory rules of evidence. The agency or hearing examiner shall admit all testimony having reasonable probative value, but shall exclude immaterial, irrelevant or unduly repetitious testimony or evidence that is inadmissible under s. 901.05. The agency or hearing examiner shall give effect to the rules of privilege recognized by law. Basic principles of relevancy, materiality and probative force shall govern the proof of all questions of fact. Objections to evidentiary offers and offers of proof of evidence not admitted may be made and shall be noted in the record.

Highland notes that in directing the Commission to further study whether the scientific literature finds any relationship between wind turbine noise and human health effects, the Legislature has limited the review to peer-reviewed literature. ([PSC REF#: 284905](#) at 5-6.) Highland thus urges the Commission to “not take official notice of rebuttal or countervailing evidentiary materials that have not been subjected to a similarly stringent standard.” (*Id.*) Doing so, Highland argues, “would run contrary to the policy underpinning Wis. Stat. § 227.45(3) and would undermine the Commission’s ability to reach a well-reasoned outcome premised on reliable and verifiable scientific facts.” (*Id.*)

Commission Alternatives

Alternative One: In addition to the 2014 Review and 2015 Review accept:

- a. Some or all of the ten additional peer-reviewed studies since the 2015 Review offered by Clean Wisconsin;¹⁶
- b. One or both of the two peer-reviewed articles since the 2015 Review, and/or the magazine article offered by the Town;¹⁷
- c. Some or all of the peer-reviewed studies referenced in the comments of members of the public that could be located by Commission staff;¹⁸ and/or
- d. Some or all of the other materials referenced in the comments of members of the public that could be located by Commission staff.¹⁹

Alternative Two: Do not accept any other studies, articles, or reference materials other than the 2014 Review and 2015 Review.

B. Comments

Both the parties and members of the public provided written comments. The comments of the parties provide information responsive to specific issues identified in the Commission's Order to Reopen. There are some general trends to the comments received by the parties and members of the public. Appendix B identifies and categorizes the public comments received. The Commission has been separately provided with the offered comments for its independent review. Commission staff's summary in this memorandum and in Appendix B are provided

¹⁶ Listed in Appendix A, at pp. 1-3.

¹⁷ Listed in Appendix A, at p. 4.

¹⁸ Listed in Appendix A, at pp. 5-6.

¹⁹ Listed in Appendix A, at p. 7.

merely to guide the Commission and are not intended to supplant the Commission's independent review and assessment of the comments.

Fifty-one of the public comments provided were from individuals living in the project area of the proposed project. Some of these address the specific issues that are part of this reopening, while others express more general opposition to the project. Some commenters from the project area provided personal health information they asked to be considered, either in their individual comment or as part of the Confidential Town of Forest's comment. ([PSC REF#: 285292.](#))

Those from outside the project area that provided comments can first be grouped into those that support or oppose the project. Generally, those in support of the project do not provide much information that is relevant for consideration in this reopening, apart from general statements that wind energy has not been proven to cause negative health impacts and is less damaging than other forms of power generation. Those generally opposed to the project have provided a wider range of comments. No public comments opposed the Commission's intention to remove the 95 percent compliance standard. Commenters generally want to retain the six residences with protections and/or add more residents that can show they have health concerns. Some commenters request a hearing to address this issue. A smaller group of those that commented on this topic state that there should be the same noise standard across all residences in the project area, generally with a lower limit than is provided for in Wis. Admin. Code § PSC 128.14. Those in support of the project also want standard rules to apply to all residences, but state the existing limits agreed upon are sufficient to be protective of human health.

A few comments were received on the content or composition of the two papers noticed as part of this reopening. Those in support of the project typically referred to the similar

conclusions drawn by both reviews and the lack of evidence showing wind farms cause negative human health impacts. Several of those in opposition to the project called for greater consideration of the Minority Report of the 2014 Review, stating their concerns about the make-up of the Wind Siting Council and belief the Minority Report shows alternate conclusions.

Some commenters called into question the 2015 Review, particularly the use of information from Health Canada's Community Noise and Health Study. Some comments contain factual errors stating, for example, that there was no peer-reviewed information available at the time of the 2015 Review, or that it is impossible to know what numbers of participants were located at distances or sound limits comparable to those in wind farm areas in Wisconsin. The 2015 Review did provide general information on the study panel and methods to give the context for the size and extent of the study, while information on the results was obtained from those peer-reviewed articles available at the time (to which there are now six additional sources, as described above). Health Canada's study has released more information on the process and data from the study than most others, and tables that show distances and modeled sound levels for each participating residence are available.²⁰

A lengthy comment was received from Richard James, who was an expert witness for Forest Voice in earlier proceedings ([PSC REF#: 284895](#)) that included a rebuttal of Health Canada's study conclusion found in Michaud *et al.* (1).²¹ The comment states the Health Canada study does not support an association between exposures of wind turbine noise up to 46 dBA and evaluated health-related endpoints. Richard James' comment provides his rebuttal on pages 2-3 with a supporting graph on page 26 showing his assertion that by looking at the data provided

²⁰ For example, although the Health Canada study only had six participating residences with modeled sound levels above 45 dBA, there were 234 residences at sound levels less than or equal to 40 to 44 dBA.

²¹ Michaud *et al.* (1) 2016. Exposure to wind turbine noise: Perceptual responses and reported health effects ([PSC REF#: 285640](#)), provided by both Richard James and Clean WI.

within the Michaud paper “there is a clear increase in the incidence of the subject adverse health effects as the sound level outside the test subjects’ homes increase.” ([PSC REF#: 284895](#) at 2.) However, what his comment fails to mention is that he omitted some of the data provided by the Health Canada study on the incidence of symptoms at sound levels below 25 dBA. He states the lowest exposure as that of 25-30 dBA when the Health Canada graph clearly has a column for respondents at levels less than 25 dBA. With the inclusion of this column of data, his trends are not illustrated. (See Appendix C of this document.)

One factual error stated multiple times within the comment provided by the Town is that the 2014 Review discusses sleep deprivation being reported by between 40-66 percent of the effected population when wind turbines operate above 45 dBA. This is incorrect; on page 8 of the 2014 Review, these numbers refer to numbers of respondents that reported annoyance, and impacts to sleep are not stated here. Sleep disturbance is referenced at the end of page 8 and continues on page 9 of the 2014 Review which states:

Sleep disturbance was reported by approximately 33 percent of respondents and it increased with greater environmental noise levels. However, of these individuals, 86 percent attributed their sleep disturbance to people, animals, or traffic/mechanical noise and 14 percent (approximately 4 percent of total respondents) indicated that wind turbine noise interrupted their sleep.

This inaccurate reading of the 2014 Review is repeated several times, linking sleep disturbance and annoyance, when in fact all studies that formed this review had these issues considered separately, with different numbers of respondents reporting effects for each issue.

Many other comments provided by those generally in opposition to the project are wide ranging on the topic of wind turbines and the impact they are believed to have on human health. Personal anecdotes from those in other areas of wind farms, both in Wisconsin and other states or countries, are provided. Many comments address the concern over audible noise and infrasound or low-frequency noise and state they do not believe this has been adequately addressed either by

noise limits or setbacks. Some commenters share concerns over property value and the stress it causes them. Finally, a number of opposition comments do not address any of the issues of this reopening, but merely state frustration with the process and disagreement with the Commission's decision on this project.

When deciding which, if any, of the comments to accept into the record, the Commission should assess the "reasonable probative value" of the comments, and consider whether immaterial, irrelevant or unduly repetitious testimony or evidence should be excluded. Wis. Stat. § 227.45(1).

Commission Alternatives

Alternative One: Accept all comments into the record as having reasonable probative value.

Alternative Two: Accept comments with reasonable probative value into the record, but exclude specific comments as immaterial, irrelevant, or unduly repetitious.

Alternative Three: Exclude all comments from the record as without reasonable probative value, immaterial, irrelevant, or unduly repetitious.

Percentage-Based Compliance Standard

The first substantive issue remanded to the Commission by the circuit court relates to the standard to be used to measure compliance with the noise standards post-construction. The parties do not dispute that a pre-established standard for determining how to measure any potential future non-compliance with the audible noise requirements is not required for approval of the project. However, the comments from the Town and Forest Voice inaccurately conflate and confuse the proposed curtailment plan and the compliance standard. Thus, a summary of Highland's proposed curtailment plan compared to the compliance standard is necessary to provide context.

A. Curtailment Plan

Wisconsin Admin. Code § PSC 128.14(3) provides that “an owner shall operate the wind energy system so that the noise attributable to the wind energy system does not exceed 50 dBA during the daytime hours and 45 dBA during the nighttime hours.” While the Commission is only required to *consider* whether installation or use of the facility is consistent with the standards specified in the rules promulgated by the Commission, in the Final Decision on Reopening the Commission found it reasonable to require Highland to meet the 50 dBA daytime and 45 dBA nighttime noise standards for this project. ([PSC REF#: 192339](#) at 4.)

In the Final Decision in the initial proceeding, the Commission denied Highland’s application for a CPCN after finding the sound modeling showed the project would not meet the nighttime noise limits required by Wis. Admin. Code § PSC 128.14(3), using the most conservative sound modeling assumptions. ([PSC REF#: 182254](#).) Highland subsequently requested reopening of the docket and submitted a revised curtailment plan and associated sound modeling that it claimed would meet the applicable noise limits. ([PSC REF#: 183159](#).)

Highland’s proposed plan consisted of the following:

- Computer modeling to determine which turbines are required to be operated in reduced noise operating modes in order to meet the noise requirements.
- Minimizing the amount of lost energy production from reduced noise operation by adjusting the levels of reduction based on wind direction and non-participating residence locations in relation to the wind turbines requiring curtailment. This analysis is referred to as the “directivity” analysis throughout the record in the reopened proceeding.
- Programming the turbines based on available reduced operating modes for each turbine model alternative and the directivity analysis. Throughout the reopened proceeding, this proposed programming strategy is referred to as “sector cutout function,” “sector management capabilities,” or “sector cutout management.”

- Verification of compliance with applicable noise limits by post-construction noise monitoring.

([PSC REF#: 192339](#) at 20.)

After holding further hearings and reviewing the new evidence, the Commission found the revised curtailment plan demonstrated, using the most conservative modeling assumptions, that the proposed project will meet the noise limits specified in Wis. Admin. Code § PSC 128.14(3). (*Id.* at 5.) The Commission specifically concluded that curtailment is an appropriate strategy to meet the noise limits, and Highland's proposed curtailment plan ensured compliance with the applicable daytime and nighttime noise limits. (*Id.* at 22.)

Upon judicial review, the circuit court upheld the Commission's determination holding that "there is substantial evidence in the record for the Commission to conclude that Highland's curtailment plan ensured compliance. The Town, the Commission and Highland all point to exhibits and testimony that directly address the issue of the ability of the curtailment plan to comply with applicable standards. The Town may not like the conclusion that was reached, but the conclusion the Commission reached was clearly supported by substantial evidence in the record." (Decision and Order at 115.)

B. Noise "Spikes"

Despite finding the curtailment plan ensured compliance, the circuit court also found "there is really no question that noise levels from the generators of the type proposed in this project will spike at times in excess of the noise standards." (Decision and Order at 102.)

The Town and Forest Voice argue in their comments that these spikes are unavoidable and undercut the Commission's finding that the sound modeling using the curtailment plan demonstrates compliance with the noise standards. ([PSC REF#: 285293](#) at 4; [PSC REF#: 284904](#) at 7.) However, the sound modeling used calculations based on international standards

and the testimony on whether spikes *in excess of the noise limits* will actually occur was extremely limited. The Commission did not find that spikes in excess of the noise limits would occur—as the sound modeling predicted compliance—and actually stated in the Final Decision in the initial proceeding that “that there *may* be unavoidable circumstances notwithstanding the use of the most conservative modeling where curtailment may be necessary to avoid or respond to temporary excursions above stated audible noise limits.” ([PSC REF#: 182254](#) at 18.) (Emphasis added). This statement was not repeated in the Final Decision on Reopening, which merely noted that one witness believed that such temporary excursions are unavoidable. ([PSC REF#: 192339](#) at 35.)

The Town and Forest Voice argue in their comments that these spikes are unavoidable and dispute the Commission’s finding that the sound modeling using the curtailment plan demonstrates compliance with the noise standards. However, as noted above, the Commission’s determination that the curtailment plan ensured compliance was upheld by the circuit court and not appealed. Further, a monitoring and reporting protocol was required to ensure the project, as built, functions as predicted by the sound modeling and does not exceed the noise limits.

C. The 95 Percent Compliance Standard

In its Final Decision in the initial proceeding, the Commission noted that although not shown by the sound modeling, one witness believed there was the possibility of unpredicted noise spikes occurring and the witness opined that he would consider the project to be in compliance if the measured sound level is in compliance with the limit 95 percent of the time or more. ([PSC REF#: 182254](#) at 18.) As a result, when the project was approved in the Final Decision on Reopening, the Commission found that a post-construction showing of compliance

with the noise limits at or above 95 percent of the time would be adequate for the Commission to determine that the project was compliant. ([PSC REF#: 192339](#) at 35.)

In arguments before the circuit court, the Town argued that the noise limits in Wis. Admin. Code § PSC 128.14(3) are intended to be “absolute”²² limits not to be exceeded and the issue of a compliance standard was not noticed or discussed by any of the parties in the original proceeding. (Town of Forest Initial Brief at 11-12.)

Upon judicial review, the circuit court found the Commission did not provide adequate notice or a proper hearing on the issue of adopting a compliance standard and did not have substantial evidence in the record to support the 95 percent compliance standard. (Decision and Order at 115-16.) The circuit court therefore set aside the 95 percent compliance standard and remanded the issue to the Commission. (*Id.*) In its opinion, the circuit court specifically noted that no additional evidence had been obtained about the compliance standard in the reopened proceeding. (*Id.* at 103.)

In the Order to Reopen, Notice and Request for Comments, the Commission stated that it intended to modify its Final Decision on Reopening to remove the pre-established 95 percent compliance standard that was set aside by the circuit court and address any complaints concerning alleged non-compliance with the noise standards, based on the specific factual situation, at the time any non-compliance is alleged. This approach is consistent with the process used to investigate other complaints regarding non-compliance with a Commission order or rule.

²² The term “absolute standard” or “absolute limits” was constantly misused throughout this proceeding. A correct description of the term is included in Commission staff’s January 11, 2013, Briefing Memorandum in this docket, which states, “Of the two common types of wind noise limits, absolute and ambient-based, the Wis. Admin. Code § PSC 128.14 noise limits are considered to be absolute. Absolute limits are maximum sound levels from wind facilities at sensitive receptors, regardless of the ambient sound level. Ambient-based noise limits specify some increment above the ambient sound level that may not be exceeded.” ([PSC REF#: 178920](#) at 9.)

In comments, Highland, Clean WI, and Forest Voice all request that the Commission remove the 95 percent compliance standard for determining post-construction compliance. ([PSC REF#: 284905](#) at 2; [PSC REF#: 284903](#) at 1; [PSC REF#: 284904](#) at 6.) Several other members of the public also request that the 95 percent compliance standard be removed. RENEW did not address this issue. The Town is the only party that requests that the Commission develop a compliance standard, percentage-based or otherwise. ([PSC REF#: 285293](#) at 3.) The Town, however, throughout the underlying litigation, opposed any compliance standard arguing that the Commission had consistently “led the parties to believe that the Commission would base the Final Decision on whether Highland proved the Project would comply with PSC 128 noise limits 100% of the time.” (Town of Forest Reply Brief at 36.)

As noted by both Highland and Clean WI, Highland will still be required to comply with robust, highly-detailed post-construction noise monitoring and reporting protocols. To ensure adequate information is available to evaluate whether post-construction noise levels are compliant with Wis. Admin. Code § PSC 128.14(3) and the predictions of the sound modeling, the Commission required Highland to implement a comprehensive monitoring and reporting protocol that required:

- Continuous measurements at two distinct locations with immediate reprogramming of the turbines if any are found to exceed the applicable noise limits, as well as a roving measurement setup that can be moved to different locations to respond to any landowner complaints.
- The use of specific measurement and techniques to measure sound levels and ground wind speed and direction at each location.
- Specific parameters to be measured as well as audio samples of at least one minute per interval for nighttime hours.
- Data analysis to specifically identify the noise attributable to the operation of the wind energy system, as opposed the ambient sound levels.

- Compliance reports to be filed with the Commission proving all measured noise levels and ground and wind data. The reports are also required to describe in detail how the data was collected and analyzed.
- A “roving” measurement system to measure noise levels at specific locations in the event of a complaint. If analysis of the data shows that turbine related noise levels exceed the limit, Highland would be required to immediately reprogram the adjacent turbine or turbines and continue testing for another two weeks to a month until compliance is demonstrated.
- Reports including the data necessary to ensure that the turbines subject to the curtailment plan were operating in the correct reduced noise operation modes under the correct operating conditions.

([PSC REF#: 192339](#) at 27-34.)

Highland and Clean WI argue that this comprehensive noise monitoring and reporting protocol is more than adequate to ensure Highland is in compliance with the noise limits in Wis. Admin. Code § PSC 128.14(3), incorporated in the Final Decision on Reopening. ([PSC REF#: 284905](#) at 2-4; [PSC REF#: 284903](#) at 1.) Highland further emphasizes that the Commission retains authority to monitor and, if necessary, enforce the noise limits. As noted by the Commission, Wis. Admin. Code § PSC 128.14(3) does not articulate the methodology that is to be used to measure compliance or what constitutes compliance with the 50 dBA daytime and 45 dBA nighttime noise standards. ([PSC REF#: 192339](#) at 35.) However, the post-construction noise monitoring and reporting protocols would ensure the Commission has specific factual information about the situation to determine whether Highland is in compliance once the project is constructed.

The Town and Forest Voice continue to argue, as they did before the Commission and the Town did before the circuit court, that the proposed project cannot adhere to the noise limits in Wis. Admin. Code § PSC 128.14(3). However, the finding that the noise levels predicted by the

sound modeling are below the noise limits is not the same as a finding that, as built, the project complies with the applicable noise limits.

One of the key purposes of the post-construction sound monitoring protocols is to ensure the Commission has reliable post-construction data to ensure the project, as constructed, meets the noise standards predicted by the sound modeling. If a circumstance does arise where the noise from a turbine results in an excursion above stated audible noise limits that was not predicted by the sound modeling, this would be identified by the continuous measurements, and Highland would be required by the Commission's Final Decision on Reopening to immediately institute curtailment by reprogramming the turbine to ensure it does not exceed the applicable noise limits. ([PSC REF#: 192339](#) at 28.)

Despite the fact that the project is not yet constructed making it impossible to know if the sound modeling in fact will fail to predict noise spikes in excess of the noise limits, the Town now argues that the Commission should preemptively create a pre-established compliance standard that would be used to adjudicate any complaints the Town believes are inevitable. ([PSC REF#: 285293](#) at 3-4.) Doing so, the Town argues, would "resolve this ambiguity" as it alleges "the Commission has already indicated that it may consider some degree of deviation from the standard to be acceptable under normal operating conditions." (*Id.* at 6.) In essence, the Town argues that "some form of compliance standard is inevitable for this project," and the Commission should adopt a compliance standard now "rather than after construction is completed and the unavoidable noise violations begin." (*Id.* at 6-7.)

A pre-established standard for judging future non-compliance with the audible noise requirements is not required for approval of the project. The Commission in the Final Decision on Reopening has already required Highland to comply with the complaint procedure in

Wis. Admin. Code. § PSC 128.40 and comply with detailed post-construction sound monitoring protocols that will show whether the constructed project is in compliance with the noise limits. Moreover, the establishment of a compliance standard now would lack the information that would be available from the post-construction sound monitoring protocols.

Forest Voice also raises concerns regarding the effectiveness of the complaint process under Wis. Admin. Code § PSC 128.40. It asserts that “multiple individuals living near other existing wind farms in Wisconsin testified that they were never able to satisfactorily resolve complaints through the Commission’s process.” ([PSC REF#: 284904](#) at 9.) However, Wis. Admin. Code § PSC 128.40 became effective on March 1, 2011. The most recent wind farm approved by the Commission was the Glacier Hills Wind Park in Columbia County, Wisconsin, in a Final Decision dated January 22, 2010. ([PSC REF#: 126124](#).) Thus, there are no wind farms in Wisconsin approved by the Commission to which the complaint process in Wis. Admin. Code § PSC 128.40 is applicable.

Procedural Considerations Related to Removal of the Percentage-Based Compliance Standard

The Town requests that the Commission hold a hearing on the issue of removing the 95 percent compliance standard ([PSC REF#: 285293](#)), and Forest Voice argues that not holding a hearing would be in violation of the Decision and Order of the circuit court. ([PSC REF#: 284904](#) at 2.) The Commission provided an opportunity to be heard through a 30-day comment period. All the parties, except the Town, express support for the Commission’s intention to remove the 95 percent compliance standard. While Forest Voice cites the Decision and Order of the circuit court, that order addresses the process for *adopting* a compliance standard, not removing the compliance standard and requiring adherence with Wis. Admin. Code

§ PSC 128.14. Further, the Town fails to cite any additional authority that would require the Commission to grant its request for a hearing.

Commission Alternatives

Alternative One: Modify the Final Decision on Reopening to remove the pre-established 95 percent compliance standard and address any complaints concerning alleged non-compliance with the noise standards, based on the specific factual situation, at the time any non-compliance is alleged.

Alternative Two: Direct Commission staff to hold a hearing on whether the pre-established 95 percent compliance standard should be removed or on adoption of a compliance standard.

Alternative Three: Provide an additional comment period for the parties to respond to the comments, clearly state why they believe they have a right to a hearing or dispute another party's right to a hearing, and indicate what new evidence they would present on this issue during a hearing.

Lower Nighttime Noise Limits for Identified Residences

The second substantive issue remanded to the Commission relates to the acceptance of an agreement by Highland to comply with a lower nighttime noise standard for six “sensitive” residences. In the reopened proceeding, Highland agreed to limit to 40 dBA during nighttime hours, the sound attributable to the turbines near six identified residences occupied by potentially “sensitive” individuals.²³ Highland also submitted sound modeling that demonstrated compliance with this lower limit at these residences.

²³ Clean WI argues that it unclear what makes a resident “sensitive” to wind turbine noise. ([PSC REF#: 284903](#) at 7-8.)

During the rehearing, several other residents requested that the Commission require Highland to apply to them the lower noise limits applicable to these six residences and the Town submitted health questionnaires that ultimately become Ex.-Forest-Junker-20, listing a number of additional “sensitive” residences. The Commission determined the following:

There is debate in the scientific community as to whether noise at certain levels from wind turbines causes or contributes to any health issues. ***When the Commission established the noise limits in Wis. Admin. Code ch. PSC 128, it considered these alleged impacts and concluded that the established noise standards were protective of public health and welfare.*** As the Commission noted in its prior decision in this proceeding, ***the Commission is not convinced that a causal link between audible or inaudible noise at wind generating facilities and human health risks has been established to a reasonable degree of scientific certainty.***

While the Commission, based upon the available scientific literature, may have doubts as to whether noise from the turbines, whether it be at 40 dBA, 45 dBA or 50 dBA, can cause or worsen any of the self-reported conditions individuals living at the six occupied residences may have, the Commission has erred on the side of caution by requiring Highland to demonstrate in modeling using the most conservative assumptions that the project will comply with the applicable noise limits. In addition, the Commission, out of an abundance of caution, accepts Highland’s voluntary agreement to obligate itself to a lower limit of 40 dBA for the six identified residences, but the Commission is unwilling to require Highland to extend this accommodation to others—especially where, as here, the sound modeling submitted in this reopened proceeding demonstrates that the estimated levels are at or below 40 dBA for the commenters’ residences identified in the reopened proceeding. As a result, the Commission finds that it is not necessary to extend the 40 dBA noise limit to the three additional affected residences identified in the reopened proceeding.

([PSC REF#: 192339](#) at 16-17.) (Emphasis added.)

The circuit court ultimately found that the Commission failed to provide a full hearing on the selection of the sensitive residences and the Commission’s acceptance of Highland’s proposal on the six sensitive residences was without substantial evidence in the record. (Decision and Order at 116-17.) The court therefore remanded the issue to the Commission to reopen the docket “*solely* for the purpose of allowing the parties *to state* why other sensitive residences, already identified, should be considered and the Commission can then decide if others, already identified, should be

included with the original six residences.” (*Id.* at 116.) (Emphasis added.) The circuit court specifically stated that the remand was “not for further evidentiary hearing on other residents who may be sensitive to noise or shadow flicker” (*Id.*)

In comments for the reopened proceeding on remand, the Town provides updated health surveys and statements from potential “sensitive” residences describing the existing health issues that residents believe may be aggravated by the wind turbines proposed to be constructed by Highland and conditions residents believe are caused by wind turbines. ([PSC REF#: 285293](#) at 42-74.) These surveys and statements list a myriad of health conditions including: mental health issues; hypersensitivity to sound; sleep disturbance/disorder; migraines; heart problems; macular degeneration; high blood pressure; hypertension; headaches; vertigo; dizziness; ear pain; stress; insomnia; autism spectrum disorder; ADHD; extreme sensitivity to stimulus; epilepsy/seizures; heart valve issues; extra heart beat; diabetes; chronic lymphocytic leukemia; hearing loss; Asperger’s syndrome; tinnitus; Parkinson’s disease; balance disorder; osteoarthritis; light headedness; motion sickness; heart attacks; arterial fibrillation; sleep apnea; anxiety; depression; and asthma. (*Id.*)

Below are two charts that identify the property locations at issue²⁴ and a summary of the alleged conditions, based upon information from the initial proceeding, as supplemented by the information the Town has provided in this reopened proceeding. The first chart identifies the six previously identified residences and the reported health concerns, and the second chart identifies

²⁴ There is some confusion as to the total number of residences at issue. The circuit court, presumably relying upon Ex.-Forest-Junker-20, identifies a total of 17 residences at issue: six that received the lower noise standard, and eleven that did not. However, this total number is incorrect. Of the 17, there is one duplicate residence. In addition, two of the six receiving the lower standard are not included in Ex.-Forest-Junker-20. Adding the 16 separate residences and the two not included in the exhibit leads to a total of 18 residences that are at issue and the subject of the court’s remand. There is also confusion as to the identified residences given some typographical errors in Ex.-HWF-Mundinger-10. Commission staff notes these errors in the information that follows in an attempt to resolve further confusion.

the additional residences from Ex.-Forest-Junker-20 with a summary of the reported health concerns.

Six Identified Residences Listed in Ex.-HWF-Mundinger-10 – Health Conditions Listed in Public Comments and Transcripts – Updated with Information from Town of Forest Comments		
House Number	Address	Health Conditions
1 (Same as House No. 1 in Ex.-Forest-Junker-20)	2670 Highway 64	Severe autism - PSC REF#: 164962, 171119, 175196, 175140
2	2719 210th AVE	Autism spectrum, ADHD - PSC REF#: 175141, 175196 <i>Updated to also include: Migraines, insomnia, epilepsy</i>
3 (Same as House No. 8 in Ex.-Forest-Junker-20)	3116 County Road Q	Extremely hypersensitive to noise, not diagnosed, but possibilities include autism spectrum disorder, undisclosed mental health issue; extreme sensitivity to sound and sleep disturbance - PSC REF#: 177173, 175141, 175196 <i>Updated to also include: Migraines</i>
4 (Same as House No. 3 in Ex.-Forest-Junker-20)	2577 County Road P <i>Note: Address incorrect in Ex.-HWF-Mundinger-10. Actual address is 2257 CTY RD P.</i>	Headaches/migraines, hearing problems, motion sickness PSC REF#: 177173, 175141
5 (Same as House Nos. 16 and 17 in Ex.-Forest-Junker-20)	2946 Highway 64 <i>Note: Address incorrect in Ex.-HWF-Mundinger-10. Actual address is 2948 Highway 64.</i>	Parkinson's disease, unsteadiness, motion sickness, seizure disorder PSC REF#: 177175, 175196
6	2168 County Road P	Inner ear problem that causes extreme difficulty with balance, even walking PSC REF#: 175140 <i>Updated to also include: Migraines, high blood pressure, vertigo, heart valve issues, extra heart beat</i>

Ex.-Forest-Junker-20 – Updated with Information from Town of Forest Comments		
House Number	Address	Health Conditions
1 (Same as House No. 1 in Ex.-HWF-Mundinger-10) Included in Original 6	2670 State Road 64, Emerald	Severe autism

2	3188 20th Street, Glenwood City	Heart condition
3 (Same as House No. 4 in Ex.-HWF-Mundinger-10) Included in Original 6	2257 County Road P, Clear Lake	Headaches/migraines, hearing problems, motion sickness
4	1892 County Road D, Glenwood City	Heart conditions, hearing problems, tinnitus, hearing loss <i>Updated to also include: Sleep apnea, sleeping problems, high blood pressure, heart arrhythmia, hearing loss, dizziness during day</i>
5	3146 205th Avenue, Glenwood City	Hearing problems, hearing aide
6	3162 State Road 64, Glenwood City	Heart condition, hearing problems, dizziness or vertigo, tinnitus, hearing aid, suffered hearing loss <i>Updated to also include: Increased sensitivity to motion and light, diabetes, chronic lymphocytic leukemia, increased hearing loss, hearing aids</i>
7	2119 County Road P, Emerald	Hearing problems, hearing aide
8 (Same as House No. 3 in Ex.-HWF-Mundinger-10) Included in Original 6	3116 County Road Q, Clear Lake	Child with problems with exposure to loud noise
9	2722 200th Avenue, Emerald	Headaches, hearing problems, sleepiness, dizziness or vertigo, tinnitus, suffered hearing loss
10	1969 County Road P, Glenwood City	Irregular heartbeats <i>Updated to also include: Asthma, prone to headaches, hearing loss, vertigo,</i>
11	2953 210th Avenue, Emerald	Headaches/migraines, hearing problems, suffered hearing loss. <i>Updated to also include: High blood pressure, clinical depression, tendency toward headaches, increased hearing loss, tinnitus,</i>
12	2969 210th Avenue, Emerald	Motion sickness

13	3174 205th Avenue, Glenwood City	Hearing problems, suffered hearing loss, heart palpitations <i>Updated to also include: Heart attacks, atrial fibrillation, sleep apnea, macular degeneration, severe headaches, hypersensitivity to noise,</i>
14	2878 County Road Q, Clear Lake	Headaches/migraines
15	3136 County Road Q, Clear Lake	Heart palpitations, enlarged heart, headaches/migraines, heart condition <i>Updated to also include: Macular degeneration, high blood pressure, hypertension, headaches, sleep disorder</i>
16 (Same as House No. 5 in Ex.-HWF-Mundinger-10) Included in Original 6	2948 Highway 64, Glenwood City	Parkinson's disease, unsteadiness, motion sickness; seizure disorders

The 2948 Highway 64 location requires some further explanation. The residents of that property have since moved out of that property and into an adjacent residence not previously identified, 2920 Highway 64. ([PSC REF#: 285293](#) at 59.) Order Condition 9 of the Final Decision on Reopening states: “Highland may eliminate the 40 dBA limit at any of the six identified residences when the resident with special needs no longer resides at the residence.” ([PSC REF#: 192339](#) at 48.) The Town, in its comments in this reopened proceeding on remand, appear to be seeking to add an additional property (2920 Highway 64) and to retain the lower standard at the previously identified property (2948 Highway 64) for the benefit of new occupants who have submitted new information about their health concerns (seizure disorder, motion sickness, anxiety, depression, noise and light exposure causes headaches and flu-like symptoms). ([PSC REF#: 285293](#) at 59 and 65.)

The Town requests that the Commission expand the 40 dBA nighttime restriction to all identified residences, and apparently a newly identified residence adjacent to a previously

identified residence, arguing that “there is no appropriate method of distinguishing between their individual circumstances without a more thorough examination as provided by a contested case.” (*Id.* at 7.) The Town also provides three studies and pointed to the minority report of the wind siting council that it believes support the causal link between the health conditions identified and wind turbine noise. (*Id.* at 18-41.)

Forest Voice provides no studies, but urges the Commission “to give full weight to the real-life experiences of members of the public who live near wind turbines.” It argues that “[s]o called ‘anecdotal’ evidence should not be ignored.” ([PSC REF#: 284904](#) at 13.) In addition, Forest Voice argues that the standard, “a reasonable degree of scientific certainty,” is incorrect and the proper standard under Wis. Stat. §196.491(3)(d)(4) is whether the project will have an “undue adverse impact on other environmental values, such as, but not limited to . . . public health and welfare. . . .” (*Id.* at 11-12.)²⁵ Finally, Forest Voice argues that the Commission has “violated” the order of the circuit court by reopening the matter to take official notice of the two reports and to consider whether lower noise limits should be extended to any or all already identified “sensitive” residences, and removing the lower nighttime standard for the six residences would “smack of retaliation.” (*Id.* at 16.)

Highland’s comments discuss the findings of the 2014 Review and 2015 Review and argue these studies of the peer-reviewed literature support the Commission’s conclusion in both the Final Decision and Final Decision on Reopening, which preceded the studies, that no causal relationship has been established between wind turbines and human health to a reasonable degree

²⁵ Forest Voice is simply incorrect about the standard applied in this docket. The Commission specifically found: “The Highland project, as modified by this Final Decision on Reopening, will not have undue adverse impact on other environmental values such as, but not limited to, ecological balance, public health and welfare, historic sites, geological formations, the aesthetics of land and water, and recreational use.” ([PSC REF#: 192339](#) at 5.) This finding was not challenged in the judicial review proceedings.

of scientific certainty. ([PSC REF#: 284905](#) at 5-9.) In the absence of reliable evidence showing that the health conditions listed by residents in the project area would be aggravated by wind turbines or that they would otherwise be susceptible to adverse health impacts from the wind turbines at or below the noise limits in Wis. Admin. Code § PSC 128.14(3), Highland urges the Commission not to impose lower noise limits for any subset of residences in the project area. (*Id.* at 9.) Highland also questions the validity and usefulness of the Town’s surveys of residences. (*Id.* at 15.)

Clean WI argues that there is no basis for ordering a lower noise limit for potentially “sensitive” residences as there is no evidence that wind turbines cause or exacerbate health problems. ([PSC REF#: 284903](#) at 2-7.) Clean WI identifies ten new relevant peer-reviewed studies published after the 2015 Review that it asserts provide further information to refute any proposed link between wind turbine noise and health effects. (*Id.* at 4.) As a result, Clean WI urges that the “Commission should not impose sound limits that differ from those specified in Wis. Admin. Code § PSC 128 on any residences in the project area, because there is no evidence that wind turbine noise impacts human health and even if it did, the record in this case is insufficient to justify special treatment for any particular residences.” (*Id.* at 8.)

Procedural Considerations Related to the Identified Residences

The Town and Forest Voice argue that a hearing on this issue is necessary. ([PSC REF#: 285293](#) at 8; [PSC REF#: 284904](#) at 5.) Two arguments are proffered: First, the Town argues that “[t]here is no suitable method, without a contested case, of evaluating the residents in Ex.-Forest-Junker-20 and determining which have health conditions warranting protections.” ([PSC REF#: 285293](#) at 8.) Second, it argues that the “remand did not include language that would allow for the removal of the privileges already conferred on the six residences.” (*Id.* at 9.)

However, this statement ignores this language from the Decision and Order: “[t]his Court is fully aware that no accommodation needed to be ordered by the Commission for any of the 17 identified residences.” (Decision and Order at 111.) Other than asserting a right to hearing, neither party develop any legal argument to support their contentions, and neither articulates what new information would be provided at the hearing that the parties have not previously had an opportunity to present. Amending a Commission order does not require a hearing; it requires “opportunity to be heard.” Wis. Stat. § 196.39(1). The requirement to provide an opportunity to be heard is satisfied if a party is provided “[t]he opportunity to present reasons, either in person or in writing, why proposed action should not be taken. . . .” *Waste Mgmt. of Wis., Inc. v. State Dep’t of Natural Res.*, 128 Wis. 2d 59, 78, 381 N.W.2d 318 (1986) (the opportunity to present reasons, either in person or in writing, why proposed action should not be taken satisfies due process requirements). (Emphasis added.) In any matter within the Commission’s jurisdiction “the commission may initiate, investigate, and order a hearing *at its discretion* upon such notice as it deems proper.” Wis. Stat. § 196.02(7). (Emphasis added.)

Commission Alternatives (Multiple Alternatives May Be Applicable)

Alternative One: Require that Highland comply with the established noise limits in Wis. Admin. Code § PSC 128.14 for all residences as a condition of approval of the CPCN and remove language in the Final Decision on Reopening addressing the six residences.

Alternative Two: Require that Highland continue to comply with the 40 dBA nighttime noise standard only for the six previously identified residences, but not other additional residences, and amend the Final Decision on Reopening to state why these six residences were selected and others were not.

Alternative Three: Require that Highland comply with a 40 dBA nighttime noise standard for the six previously identified residences, and for those additional residences identified in Ex.-Forest-Junker-20, and amend the Final Decision on Reopening to state why these residences were selected.

Alternative Four: Provide an additional comment period for the parties to respond to the comments, clearly state why they believe they have a right to a hearing or dispute another party's right to a hearing and indicate what new evidence they would present on this issue during a hearing.

Alternative Five: Direct Commission staff to hold a hearing on whether Highland shall comply with the established noise limits in Wis. Admin. Code § PSC 128.14 for all residences as a condition of approval of the CPCN or whether a different standard shall be applicable to any residences previously identified on Ex.-Forest-Junker-20.

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Attachments:

[DL: 1409998](#): Appendix A – Summary of Articles, Reports, and Other Reference Materials Offered
[DL: 1410033](#): Appendix B – Summary of Public Comments Received
[DL: 1410032](#): Appendix C – Correction to Comment Received

Key Background Documents

[Final Decision on Reopening \(signed & served 10/25/13\) Nowak dissents - PSC REF#: 192339](#)
[Final Decision \(signed 3/14/13 - served 3/15/13\) Callisto concurs & dissents - PSC REF#: 182254](#)
[Decision and Order Dated 8-26-15.pdf - DL: 1263073](#)
[Order to Reopen, Notice and Request for Comments signed and served 3-15-16 - PSC REF#: 283217](#)

APPENDIX A – Brief summary of articles provided.

1. Clean Wisconsin provided ten additional peer-reviewed studies published since the 2015 Report. They are:
 - Michaud *et al.* (1) 2016. Exposure to wind turbine noise: Perceptual responses and reported health effects. J. Acoust. Soc. Am. 139(3). ([PSC REF#: 285640.](#))
 - A basic description of the study methodology is provided that describes the selection of residences, sound modeling and data collection. Study findings showed that annoyance toward features related to wind turbines, visual and aural, increased as wind turbine noise increased. This observed increase tended to occur when wind turbine noise levels exceeded 35 dBA. Apart from annoyance, results do not support an association between exposure to modeled wind turbine noise up to 46 dBA and other self-reported health concerns.
 - Michaud *et al.* (2) 2016. Self-reported and measured stress related responses associated with exposure to wind turbine noise. J. Acoust. Soc. Am. 139(3). ([PSC REF#: 285631.](#))
 - Self-reported results from questionnaires and objective measurements of stress (hair cortisol, blood pressure) were gathered to examine any association between calculated wind turbine noise and measures of stress. Multiple regression modeling showed that wind turbine noise exposure had no apparent influence on self-reported or objective data on stress. An association was seen between high annoyance with the blinking aircraft warning lights on turbines and some stress endpoints such as measured blood pressure.
 - Michaud *et al.* (3) 2016. Personal and situational variables associated with wind turbine noise annoyance. J. Acoust. Soc. Am. 139(3). ([PSC REF#: 285633.](#))
 - Levels of wind turbine noise were associated with levels of self-reported annoyance, from 2.1 percent when sound pressure levels were below 30 bBA to 13.7 percent when sound levels were between 40-46 dBA. This paper describes the use of multiple regression models to examine different variables that could be conceptually related to wind turbine noise annoyance. The variable that showed the strongest association with annoyance was closing a bedroom window due to wind turbine noise. Other variables associated with wind turbine noise annoyance were identified and included personal benefit, noise sensitivity, physical safety concerns, property ownership, and the area of the study (Canadian province).
 - Voicescu *et al.* 2016. Estimating annoyance to calculated wind turbine shadow flicker is improved when variables associated with wind turbine noise exposure are considered. J. Acoust. Soc. Am. 139(3). ([PSC REF#: 285635.](#))
 - This paper looked at how simple models of shadow flicker exposure appear to be inadequate when predicting the level of high annoyance response from residents exposed to shadow flicker. Other variables such as annoyance to blinking lights,

attitudes towards wind turbines and personal safety, and modeled wind turbine noise levels were shown to impact the prevalence of high annoyance at shadow flicker.

- Keith *et al.* (1) 2016. Wind turbine sound pressure level calculations at dwellings. J. Acoust. Soc. Am. 139(3). ([PSC REF#: 285637.](#))
 - This paper provides the information on the calculations of outdoor sound pressure levels (SPLs) at residences for the Health Canada Community Noise and Health Study on wind turbines. Study turbines ranged in size from 660 kW to 3 MW and all were the modern upwind design of turbine. The C-weighted measurements were done to model the lower frequencies, as LFN and infrasound are often stated as not being adequately measured with A-weighted scales. There is information provided on methods and the accuracy of modeling. The A-weighted and C-weighted results were highly correlated across the project areas showing no statistical advantage to using one metric over the other for determining WTN in the Health Canada study.
- Keith *et al.* (2) 2016. Wind turbine sound power measurements. J. Acoust. Soc. Am. 139(3). ([PSC REF#: 285639.](#))
 - This paper provides information on how the Health Canada study validated the sound power level data obtained by manufacturers of the different wind turbines that were located within the study area. These measurements were done to support the calculations of sound pressure levels (SPLs) as referenced in Keith *et al.* (1) above. The measurements done as part of this study also allowed for the determination of C-weighted sound power levels. The validation was within measurement uncertainty for all ten types of installed turbines with a standard deviation in sound power levels estimated at 2.0 dB.
- Kageyama *et al.* 2016. Exposure-response relationship of wind turbine noise with self-reported symptoms of sleep and health problems: A nationwide socioacoustic survey in Japan. Noise & Health 18(81) 53-61. ([PSC REF#: 285636.](#))
 - A study in Japan of 1,079 adult residents: 747 in areas with wind turbines, and 332 in control areas (no turbines, but otherwise similar). Face to face interviews conducted a masked survey to study the prevalence of self-reported symptoms of sleep and health problems. WTN exposures at the respondents' houses were estimated from results of field measurements, although there are some limitations based on the amount of time measurements were taken. The rate of self-reported sleep problems increased where noise exposure levels exceeded 40 dB. No association of noise exposure level with poor physical or mental health was found. Some potential confounding factors were not controlled for due to concerns about respondents' privacy. Sleep issues also seemed to be affected by personal features expressed as noise sensitivity and the feeling of visual annoyance with wind turbines.

- Blanes-Vidal and Schwartz, 2016. Wind turbines and idiopathic symptoms: The confounding effect of concurrent environmental exposures. *Neurotoxicology and Teratology* 55(2016) 50-57. ([PSC REF#: 285632.](#))
 - Attempt to examine wind turbines and health associations while looking at possible confounders. A survey was mailed to randomly selected residences in Denmark, masked to hide the topic of wind turbines. Four hundred fifty-four residents participated. This examined a wider range of environmental noise and odors rural residents would be exposed to and found there was a range of self-reported health impacts were not limited to wind turbines. According to the study, “after controlling for personal reactions to noise from sources different from wind turbines and agricultural odor exposure, we did not observe a significant relationship between residential proximity to wind turbines and symptoms.” One limitation is that noise levels at each responding residence were not calculated, as the survey used proximity to turbines instead as a surrogate of exposure to WTN.

- Katinas *et al.* 2016. Analysis of the wind turbine noise emissions and impact on the environment. *Renewable and Sustainable Energy Reviews* 58, 825-831. ([PSC REF#: 285638.](#))
 - This study looked at theoretical models of acoustic noise from wind turbines and background noise, as well as using measurements from a turbine in the models to predict wind turbine generated noise. The turbine used was smaller than those under consideration in this docket, and this might influence the results. They found that as wind speed increases and there is distance greater than 100 meters to the turbine, the turbine generated noise becomes equal to the background noise level.

- Porsius *et al.* 2015. Nocebo responses to high-voltage power lines: Evidence from a prospective field study. *Science of the Total Environment* 543(2016) 432-438. ([PSC REF#: 285634.](#))
 - This study took place in the Netherlands and involved questioning residents in the area of a new high voltage power line pre- and post- operation about their health and attitude towards environmental factors. The intent of the study was to determine whether a nocebo effect would occur for those that were concerned about their health if living in proximity to the power lines. They found an increase in symptom reporting happened with an increase in causal beliefs, with proximity to the lines not explaining any additional variance in increased symptom reporting. This study did not measure any features in regards to wind turbines, but hypothesizes that similar results to this study might be seen if extended to other environmental health issues such as turbines.

2. Town of Forest provided two peer-reviewed articles; they are:

- Harding *et al.* 2008. Wind turbines, flicker, and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them. *Epilepsia* 49(6), 1095-1098. ([PSC REF#: 285293 at 28.](#))
 - This article considers the conditions where shadow flicker could possibly trigger a photosensitive seizure in those at risk. It considers the size, rotation frequency, and viewing distances of turbines. The paper states the conditions where this is a risk, and states ways to mitigate such risk (for example keeping maximum speed of rotation below 60 rpm, which is normal for large wind farms).
 - A subsequent article by Smedley *et al.* 2010 (not referenced by the Town, but reviewed as part of the initial Wind Siting Council work developing PSC 128) further explores this topic and finds that large turbines rotate at a rate below that at which shadow flicker is likely to present a risk. For this reason, the general consensus is that large wind turbines are unlikely to present a risk of triggering an epileptic seizure through shadow flicker.
- Schomer *et al.* 2015. A theory to explain some physiological effects of the infrasonic emissions at some wind farm sites. *J. Acoust. Soc. Am* 137(3). ([PSC REF#: 285293 at 32.](#))
 - This article was written by one of the acoustic technicians that took part in the Shirley Wind report in 2012, and provides background information on that report with summaries of the methods and measurements. It draws links between the admittedly limited data at the Shirley Wind Farm to work done by the Navy on the occurrence of motion sickness symptoms when pilots were using flight simulators. There is information provided on the structure and function of parts of the middle and inner ear, similar to articles by Salt and Lichtenhan (see below). It provides a hypothesis to explain why some residents report symptoms near wind turbines along with future research recommendations.

An additional magazine article was also provided:

- Salt and Lichtenhan, 2014. How does wind turbine noise affect people? *Acoustics Today*. ([PSC REF#: 285293 at 19.](#))
 - This article summarizes some points made in other articles written by the authors (and considered by the WSC 2014 report) on how infrasound might affect features of the inner ear to create the symptoms reported. There is no discussion in this article or others by these authors as to what makes the infrasound produced by wind turbines markedly different enough from infrasound produced by many other environmental sources to create symptoms not reported elsewhere (such as along a beach). They focus instead on showing that inaudible infrasound can create some amount of physical effect on parts of the inner ear and how these effects might generate other effects such as “aural fullness or tinnitus”.

3. A list of peer-reviewed articles provided by members of the public (and not already provided by parties or specifically identified in 2014 or 2015 reports):
- Karwowska *et al.* 2015. The effect of varying distances from the wind turbine on meat quality of growing-finishing pigs. *Ann. Anim. Sci.*, 15(4), 1043-1054. Citation given by Anita Roberts ([PSC REF#: 284822](#); article at [DL: 1405356](#)).
 - This study was done in Poland on the impacts of wind turbine noise, both audible and infrasound, on the condition of pigs. Results showed some effects at distances of 50 meters (164 feet) that were not observed at 500 or 1000 meters. At 50 meters, closer than a turbine could be located to a residence, mean noise levels reached 53.6 dBA, a level above that permitted by the noise limits at non-participating residences for this project. Because the study was designed to examine the impact of noise-induced stress on animal welfare, this study appears to offer no compelling evidence of human health impacts when turbines are sited to prevent noise levels above 50 dBA.
 - Abbasi *et al.* 2015. Effect of wind turbine noise on workers' sleep disorder: a case study of Manjil wind farm in northern Iran. *Fluctuation and Noise Letters*, 14(2). Citation given by James Vanden Boogart ([PSC REF#: 284478](#); article at [DL: 1405715](#)).
 - A study involving staff members working at a wind farm in Iran, examining if wind turbine noise caused sleep disorders. Generally, this article appears to have some problems with not controlling for confounding factors, introducing bias, and regularly misstating correlation in one section and then referring to it as causation in later statements. Sound levels measured are much higher than the existing noise limits applicable to wind farms in Wisconsin, so any results would not be directly comparable.
 - Kugler *et al.* 2014. Low-frequency sound affects active micromechanics in the human inner ear. *R. Soc. open sci.* 1:140166. Citation given by James Vanden Boogart ([PSC REF#: 284478](#); article at [DL: 1405713](#)).
 - There are no references to wind turbine noise or wind generated infrasound in this article. It could function as a hypothesis generating article. Levels of infrasound produced in the laboratory setting were above those generally thought to be produced by wind farms. Subjects were exposed to a 30 hz stimulus at 120 dB SPL, which corresponds to an A-weighted level of 80 dB, which is above that expected at a non-participating residence near wind turbines.
 - Inagaki *et al.* 2015. Analysis of aerodynamic sound noise generated by a large-scaled wind turbine and its physiological evaluation. *Int. J. Environ. Sci. Technol.*

- 12:1933-1944. Citation given by James Vanden Boogart ([PSC REF#: 284478](#); article at [DL: 1405719](#)).
- This study was concerned about sound levels workers on a wind farm are exposed to: generally stated as 50-55 dBA, and claims of worker annoyance. Use of recorded sound from a turbine, set to 50 or 55 dBA was compared to another sound stimulus artificially generating sounds to use as comparison. Test subjects listened to the sounds in a lab setting while brain waves were scanned with EEG.
 - Basner *et al.* 2015. ICBEN review of research on the biological effects of noise. Noise & Health. 17(75) 57-82. Citation given by James Vanden Boogart ([PSC REF#: 284478](#); article at [DL: 1405721](#)).
 - This is an article reviewing various items of research, not limited to wind turbine noise, but looking at various sources of environmental noise. Most of the articles reviewed to form the sections on wind turbine noise were also reviewed by the WSC 2014 report, and drew the same conclusions. There is reference to an additional article on amplitude modulation, but little apart from similar conclusions to 2015 report in that it may be one further area for future study.
 - Münzel *et al.* 2014. Cardiovascular effects of environmental noise exposure. European Heart Journal. Doi:10.1093/eurheartj/ehu030. Citation given by James Vanden Boogart ([PSC REF#: 284478](#); article at [DL: 1405722](#)).
 - This article does not mention wind turbines or wind farm noise. It discusses other environmental noise sources, how certain percentages of Europeans are exposed to night noise levels above 55 dB, and the effects this noise has on health, particularly cardiovascular health.
 - Schomer and Fidell, 2016. Introductory remarks for special issue on wind turbine noise. J. Acoust. Soc. Am. 139(3). Citation given by Kristi Rosenquist ([PSC REF#: 284847](#); article at [DL: 1405802](#)).
 - An introduction article to the six studies published by Health Canada, which states that the Health Canada study is thorough, cross-sectional, and notable for its scale, design, care in execution and sophistication of analysis. It highlights the finding that there are greater odds of reporting high annoyance with wind turbine noise at levels above 35 dBA. It questions the use of A-weighted metrics, despite the correlation with C-weighted metrics in the Health Canada study and suggests that “concerns about low frequency noise are best addressed by metrics that are most sensitive to low frequency exposures.”
 - McMurty and Krogh, 2014. Diagnostic criteria for adverse health effects in the environs of wind turbines. Journal of the Royal Society of Medicine Open; 5(10)1-5. Citation given by David Lawrence ([PSC REF#: 284811](#); article at [DL: 1409547](#)).
 - A revision to a similar 2011 document reviewed as part of the WSC 2014 Review, McMurty, 2011, “Toward a case definition of adverse health effects in the

environs of industrial wind turbines: Facilitating a clinical diagnosis” ([DL: 647103](#)). The updated document provides different symptoms that the authors see as indicative of human health being affected by wind turbines.

4. Other references from members of the public, that are discreet papers, whether peer-reviewed or not:
 - Mireille Oud, 2012. Low-frequency noise: a biophysical phenomenon. Conference Proceedings from Noise, Vibrations, Air quality, and Field & Building. Stated by the author as not a peer-reviewed paper. Generally, a summary of some articles on the subject of LFN, drawing heavily on work done by Salt. Citation given by James Vanden Boogart ([PSC REF#: 284478](#) article at [DL: 1405718](#)).
 - Keith Stelling, 2015. Infrasound, Low-frequency Noise, and Industrial Wind Turbines. Information report prepared for the Multi-municipal wind turbine working group, Ontario. Generally, a summary of the topic, drawing from papers already reviewed by the WSC and others, as well as personal comments, testimony and news articles. Mentioned by Barbara Vanden Boogart ([PSC REF#: 284810](#) paper at [DL: 1405804](#)).
 - Kelley, 1987. A proposed metric for assessing the potential of community annoyance from wind turbine low-frequency noise emissions. This provides information on how a non-masked study using laboratory testing of perception of simulated infrasound was correlated to noise descriptors, including annoyance. Paper presented at the Windpower '87 Conference and Exposition. Citation given by Kristi Rosenquist ([PSC REF#: 284847](#); article at [DL: 1409484](#)).
 - Minnesota Department of Health 2009 Paper, “Public Health Impacts of Wind Turbines”. This paper is an evaluation of the health impacts of wind turbine noise and low frequency vibrations. It was reviewed as part of the initial Wind Siting Council work developing PSC 128. Citation given by Kristi Rosenquist ([PSC REF#: 284847](#); article at [DL: 556982](#)).
 - Ambrose and Rand, 2011. “The Bruce McPherson Infrasound and Low Frequency Noise Study”. This paper is a report on work done by the two authors into measurements of sound levels produced by turbines in Falmouth, MA. The information within this report was used to develop a peer reviewed journal article, (Ambrose et al. 2012 in Bulletin of Science, Technology and Society) that was included by the WSC in the 2014 Review. Citation given by Klaus Johansson ([PSC REF#: 284581](#); paper at [DL: 1409521](#)).
 - Stephen Cooper, 2014. The results of an acoustic testing program: Cape Bridgewater Wind Farm (Report released publicly January 2015). This is a lengthy report into

testing done at three residences that had complained of ill effects caused by a wind farm in Australia. Both the consultant and the utility that funded this report agree it is not a scientific study. The report states that there is not enough data in that study to justify any change in regulation, but does have some items for future investigation based on the identification of some residents noticing “sensation” when the wind farm was operating in certain conditions. It is mentioned by several commenters, with a link to the Pacific Hydro website provided by Mary Hartman ([PSC REF#: 284936](#); report at [DL: 1409601](#)).

DL: 01409998

APPENDIX B – Summary of Public Comments Received¹

Comments by parties

1. [PSC REF#: 284905](#) Comments of Highland Wind Farm, LLC
2. [PSC REF#: 284904](#) Forest Voice Comments on Order to Reopen, Notice, and Request for Comments
3. [PSC REF#: 285292](#) Town of Forest's and Sensitive Residents' Comments on Order to Reopen (Re-Filed) (Confidential)
4. [PSC REF#: 285642](#) Clean Wisconsin's Comments (Re-Filed with Exhibits)
[PSC REF#: 285631](#) Ex.-CW-Cook-1
[PSC REF#: 285632](#) Ex.-CW-Cook-2
[PSC REF#: 285633](#) Ex.-CW-Cook-3
[PSC REF#: 285634](#) Ex.-CW-Cook-4
[PSC REF#: 285635](#) Ex.-CW-Cook-5
[PSC REF#: 285636](#) Ex.-CW-Cook-6
[PSC REF#: 285637](#) Ex.-CW-Cook-7
[PSC REF#: 285638](#) Ex.-CW-Cook-8
[PSC REF#: 285639](#) Ex.-CW-Cook-9
[PSC REF#: 285640](#) Ex.-CW-Cook-10
5. [PSC REF#: 284891](#) RENEW Wisconsin
6. [PSC REF#: 284895](#) Expert Statement of Richard James

Comments by those in project area addressing the issues in the reopened docket

1. [PSC REF#: 284742](#) Public Comment by Anne Johnston
2. [PSC REF#: 284817](#) Public Comment by Autumn Berndt
3. [PSC REF#: 284647](#) Public Comment by Brandon Sanderson
4. [PSC REF#: 284877](#) Public Comment by Brenda Salseg
5. [PSC REF#: 284582](#) Public Comment by Carl Johnson
6. [PSC REF#: 284820](#) Public Comment by Cindy Kuscienco
7. [PSC REF#: 284800](#) Public Comment by Courtney Fredrick
8. [PSC REF#: 284912](#) Public Comment by Craig M Paulson
9. [PSC REF#: 284801](#) Public Comment by Dale Logan
10. [PSC REF#: 284898](#) Public Comment by Dale and Sue Riba
11. [PSC REF#: 284400](#) Public Comment by David A Schmidt
12. [PSC REF#: 284885](#) Public Comment by Diana Ericson
13. [PSC REF#: 284259](#) Public Comment by Doris Schmidt
14. [PSC REF#: 284886](#) Public Comment by Gloria Logan
15. [PSC REF#: 284720](#) Public Comment by Ines Logan
16. [PSC REF#: 284724](#) Public Comment by Jaime P. Junker
17. [PSC REF#: 284794](#) Public Comment by Janet Scepurek

¹ Where there were duplicate comments (same text by same author), only the first comment was included in this listing.

18. [PSC REF#: 284873](#) Public Comment by Jeff Ericson
19. [PSC REF#: 284917](#) Public Comment by Joy Keller
20. [PSC REF#: 284738](#) Public Comment by Karen and Allen Wienke
21. [PSC REF#: 284808](#) Public Comment by Kenneth M. Bartz
22. [PSC REF#: 284868](#) Public Comment by Kenneth Sunday Sr
23. [PSC REF#: 284731](#) Public Comment by Laverne Hoitomt
24. [PSC REF#: 284828](#) Public Comment by Lorelei Swanepoel
25. [PSC REF#: 284401](#) Public Comment by Lorna Rogers
26. [PSC REF#: 284863](#) Public Comment by Luella Deboer
27. [PSC REF#: 284826](#) Public Comment by Marilyn Benson
28. [PSC REF#: 284851](#) Public Comment by Maureen O'Brien Junker
29. [PSC REF#: 284896](#) Public Comment by Nicole Miller
30. [PSC REF#: 284906](#) Public Comment by Nikki Sunday
31. [PSC REF#: 284815](#) Public Comment by Patty Sunday
32. [PSC REF#: 284832](#) Public Comment by Rick Steinberger
33. [PSC REF#: 284753](#) Public Comment by Robert Salseg
34. [PSC REF#: 283671](#) Public Comment by SC Panasuk
35. [PSC REF#: 284937](#) Public Comment by Scottie Ard
36. [PSC REF#: 284914](#) Public Comment by Tamara Linden
37. [PSC REF#: 284402](#) Public Comment by Thomas Johnston
38. [PSC REF#: 284804](#) Public Comment by Todd Ostberg

Comments by those in project area that express general support or opposition to wind energy systems or the project

1. [PSC REF#: 284649](#) Public Comment by Chad Sanderson
2. [PSC REF#: 284892](#) Public Comment by Forest Eagle Watch
3. [PSC REF#: 284564](#) Public Comment by Jerry and Traci Goossens
4. [PSC REF#: 284754](#) Public Comment by Joe Jackelen
5. [PSC REF#: 284482](#) Public Comment by Mark Jackelen
6. [PSC REF#: 283673](#) Public Comment by Myron L. Hoitomt
7. [PSC REF#: 284722](#) Public Comment by Phillip E. Rogers
8. [PSC REF#: 284854](#) Public Comment by Rhonda Mott
9. [PSC REF#: 284852](#) Public Comment by Richard & Marlys Lambert
10. [PSC REF#: 284625](#) Public Comment by Roger A Anderson
11. [PSC REF#: 284857](#) Public Comment by Roxanne Anderson
12. [PSC REF#: 283781](#) Public Comment by Sandy Buckner
13. [PSC REF#: 284583](#) Public Comment by Sheila Renee Lammi

Comments by those outside the project area addressing the issues in the reopened docket

1. [PSC REF#: 284822](#) Public Comment by Anita Roberts
2. [PSC REF#: 284810](#) Public Comment by Barbara Vanden Boogart
3. [PSC REF#: 284404](#) Public Comment by Bernie & Cheryl Hagen

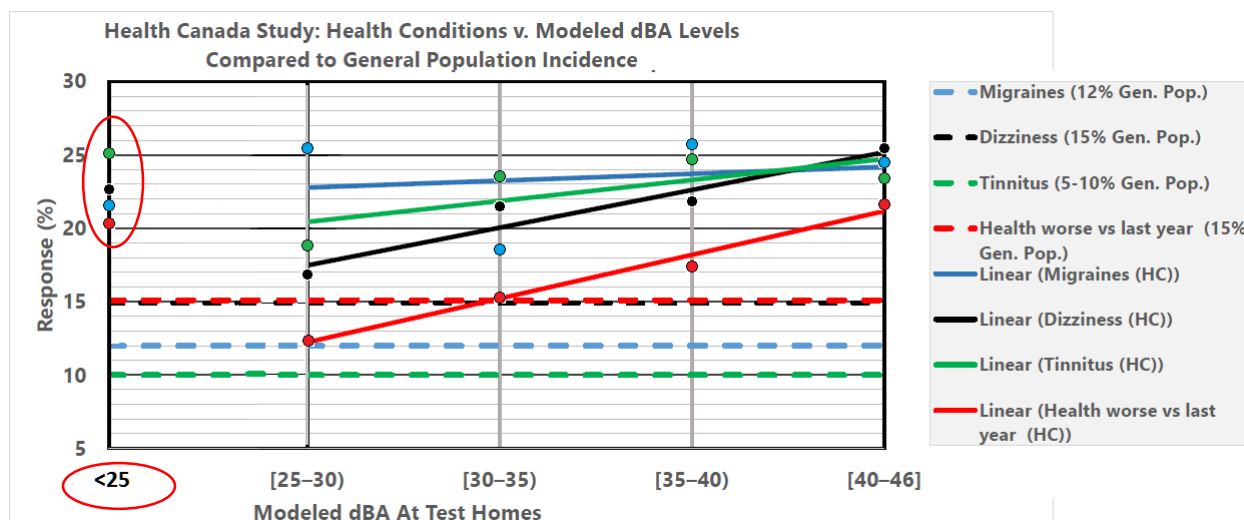
4. [PSC REF#: 284563](#) Public Comment by Darlene Mueller
5. [PSC REF#: 284791](#) Public Comment by Darrel Cappelle
6. [PSC REF#: 284480](#) Public Comment by Darren Ashley
7. [PSC REF#: 284314](#) Public Comment by David Enz
8. [PSC REF#: 284811](#) Public Comment by David R. Lawrence, MD
9. [PSC REF#: 284732](#) Public Comment by Elizabeth Ebertz
10. [PSC REF#: 284398](#) Public Comment by Erv Selk
11. [PSC REF#: 284562](#) Public Comment by Glen Robert Schwalbach P.E.
12. [PSC REF#: 284827](#) Public Comment by Henrik Svanholm
13. [PSC REF#: 284862](#) Public Comment by Jacki and Kevin Marlett
14. [PSC REF#: 284478](#) Public Comment by James M. Vanden Boogart
15. [PSC REF#: 284405](#) Public Comment by James Mueller
16. [PSC REF#: 284752](#) Public Comment by Jay J Tibbetts MD
17. [PSC REF#: 284831](#) Public Comment by Jeffrey Anthony
18. [PSC REF#: 284734](#) Public Comment by Joan Lagerman
19. [PSC REF#: 284581](#) Public Comment by Klaus Mauri Johansson
20. [PSC REF#: 284847](#) Public Comment by Kristi Rosenquist
21. [PSC REF#: 284880](#) Public Comment by Larry A. Lamont
22. [PSC REF#: 284739](#) Public Comment by Lilli-Ann Green
23. [PSC REF#: 284567](#) Public Comment by Marco Bernardi
24. [PSC REF#: 284897](#) Public Comment by Marie McNamara
25. [PSC REF#: 284699](#) Public Comment by Mark & Julie Baugnet
26. [PSC REF#: 284620](#) Public Comment by Mark Cool
27. [PSC REF#: 284940](#) Public Comment by Mark Deslauriers
28. [PSC REF#: 284403](#) Public Comment by Mary Brandt
29. [PSC REF#: 284936](#) Public Comment by Mary Hartman
30. [PSC REF#: 284818](#) Public Comment by Patricia Finder-Stone, RN, MS
31. [PSC REF#: 284566](#) Public Comment by Sandra Johnson
32. [PSC REF#: 284725](#) Public Comment by Sarah Laurie, CEO Waubra Foundation
33. [PSC REF#: 284900](#) Public Comment by Sherri Lambert
34. [PSC REF#: 284913](#) Public Comment by State Rep. Andre Jacque
35. [PSC REF#: 284780](#) Public Comment by Steve Deslauriers
36. [PSC REF#: 284813](#) Public Comment by Susan Ashley
37. [PSC REF#: 284399](#) Public Comment by Tammy McKenzie
38. [PSC REF#: 284927](#) Public Comment by Tim Lowry

Comments by those outside the project area that express general support or opposition to wind energy systems or the project

1. [PSC REF#: 284803](#) Public Comment by Aleks Kosowicz
2. [PSC REF#: 284844](#) Public Comment by Alex Bryant
3. [PSC REF#: 284833](#) Public Comment by Brian Hildebrand
4. [PSC REF#: 284812](#) Public Comment by Bridget Palecek

5. [PSC REF#: 284774](#) Public Comment by Bryan Iwen
6. [PSC REF#: 284878](#) Public Comment by Carl Siegrist
7. [PSC REF#: 284775](#) Public Comment by Carol Rudebeck
8. [PSC REF#: 284797](#) Public Comment by Christine Casper
9. [PSC REF#: 283647](#) Public Comment by Christine Mcfadzen
10. [PSC REF#: 284834](#) Public Comment by Dilon Grammentz
11. [PSC REF#: 284846](#) Public Comment by Don Richards
12. [PSC REF#: 284825](#) Public Comment by Don Wichert
13. [PSC REF#: 284814](#) Public Comment by Dondi Griffin
14. [PSC REF#: 284638](#) Public Comment by Donna Davidge
15. [PSC REF#: 284855](#) Public Comment by Duane T. Kexel
16. [PSC REF#: 284809](#) Public Comment by Elizabeth Shirah
17. [PSC REF#: 284819](#) Public Comment by Ellen Ochs
18. [PSC REF#: 284821](#) Public Comment by Federico Sciarra
19. [PSC REF#: 284796](#) Public Comment by Gregg Ewert
20. [PSC REF#: 284588](#) Public Comment by J. Holtkamp
21. [PSC REF#: 284798](#) Public Comment by Jacob Maas
22. [PSC REF#: 284807](#) Public Comment by Jan Peebles
23. [PSC REF#: 284783](#) Public Comment by Jenny Weis
24. [PSC REF#: 284799](#) Public Comment by John Hermanson
25. [PSC REF#: 284824](#) Public Comment by Joseph Wiesner
26. [PSC REF#: 284795](#) Public Comment by Joyce Radtke
27. [PSC REF#: 284845](#) Public Comment by Julie Melton
28. [PSC REF#: 284802](#) Public Comment by Kian Daniel
29. [PSC REF#: 284749](#) Public Comment by Kim Robbins
30. [PSC REF#: 284520](#) Public Comment by Larry Goodman
31. [PSC REF#: 284561](#) Public Comment by Les Storms
32. [PSC REF#: 284823](#) Public Comment by Michelle Buerger
33. [PSC REF#: 284578](#) Public Comment by Michelle Wesline
34. [PSC REF#: 284843](#) Public Comment by Mick Sagrillo
35. [PSC REF#: 284860](#) Public Comment by Niels Wolter
36. [PSC REF#: 284890](#) Public Comment by Pamela M Ritger
37. [PSC REF#: 284856](#) Public Comment by Paul W. Udee
38. [PSC REF#: 284586](#) Public Comment by Richard Rosenberg
39. [PSC REF#: 284565](#) Public Comment by Scott Wesline
40. [PSC REF#: 284806](#) Public Comment by Shirley Powell
41. [PSC REF#: 284790](#) Public Comment by Susan Kozinsk
42. [PSC REF#: 284560](#) Public Comment by Susan Storms
43. [PSC REF#: 284805](#) Public Comment by Will Stites

APPENDIX C – Corrected data regarding the graph provided in the comment by Richard James¹



This graph edits the one originally produced by Richard James in his comment by adding the original percentage reporting annoyance as data points (in corresponding colors). With the inclusion of data for the population exposed to less than 25 dB, his trends are not shown and the data comes into line with that stated by Health Canada, which found that across the sound exposures, there is not a statistically significant correlation between reported health issues and increased wind turbine noise. See Table 5 on page 10 of Ex.-CW-Cook-10 ([PSC REF#: 285640](#)) in the original paper by Health Canada for the original data (excerpt provided below).

TABLE V. Sample profile of health conditions.

Variable <i>n</i> (%)	Wind turbine noise (dB)					Overall	CMH ^a <i>p</i> -value
	<25	[25–30]	[30–35]	[35–40]	[40–46]		
<i>n</i>	84 ^b	95 ^b	304 ^b	521 ^b	234 ^b	1238 ^b	
Health worse vs last year ^c	17 (20.2)	12 (12.6)	46 (15.1)	90 (17.3)	51 (21.8)	216 (17.5)	0.1724
Migraines	18 (21.4)	24 (25.3)	56 (18.4)	134 (25.8)	57 (24.4)	289 (23.4)	0.2308
Dizziness	19 (22.6)	16 (16.8)	65 (21.4)	114 (21.9)	59 (25.2)	273 (22.1)	0.2575
Tinnitus	21 (25.0)	18 (18.9)	71 (23.4)	129 (24.8)	54 (23.2)	293 (23.7)	0.7352
Satisfaction with health ^f							
Dissatisfied	13 (15.5)	13 (13.7)	49 (16.1)	66 (12.7)	36 (15.4)	177 (14.3)	0.7262
Satisfied	71 (84.5)	82 (86.3)	255 (83.9)	455 (87.3)	198 (84.6)	1061 (85.7)	

^aThe Cochran Mantel-Haenszel chi-square test is used to adjust for provinces unless otherwise indicated, *p*-values <0.05 are considered to be statistically significant.

^bColumns may not add to total due to missing data.

^cWorse consists of the two ratings: “Somewhat worse now” and “Much worse now.”

^dHigh sleep disturbance consists of the two ratings: “very” and “extremely” sleep disturbed.

^eChi-square test of independence.

^fQuality of Life (QoL) and Satisfaction with Health were assessed with the two stand-alone questions on the WHOQOL-BREF. Reporting “poor” overall QoL reflects a response of “poor” or “very poor,” and “good” reflects a response of “neither poor nor good,” “good,” or “very good.” Reporting “dissatisfied” overall Satisfaction with Health reflects a response of “very dissatisfied” or “dissatisfied,” and “satisfied” reflects a response of “neither satisfied nor dissatisfied,” “satisfied,” or “very satisfied.” A detailed presentation of the results related to QoL is presented by Feder *et al.* (2015).

DL: 01410032

¹ [PSC REF #: 284895](#)